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Bird surveys for REDD+: avian communities indicate forest degradation in a Peruvian coffee landscape

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Background

Shade coffee cultivation in the Peruvian Andes assists in reducing emissions from deforestation because it avoids conversion to non-forest land uses such as coca and sun grown coffee farming (Fig. 1).

REDD+ is a potential finance mechanism which may provide incentives for local coffee cooperatives to maintain high shade tree cover, facilitating carbon sequestration and the conservation of biodiversity, including birds.

Question

What is the impact of coffee cultivation on the conservation of forest birds, and what can be learned from bird surveys when monitoring the Peruvian mountain forests for REDD+?

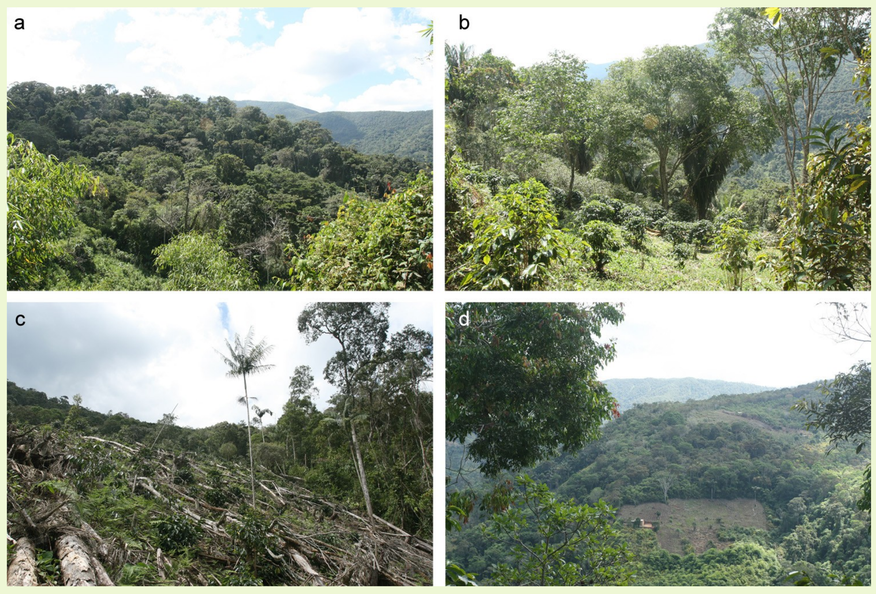

Figure 1 – Forest and deforestation in the buffer zone of the Bahuaja-Sonene National Park in Peru: a. secondary subandean humid montane forest *(puruma);* b. shade coffee (background) and sun grown coffee (foreground); c. deforestation for sun grown coffee; d. deforestation for coca cultivation

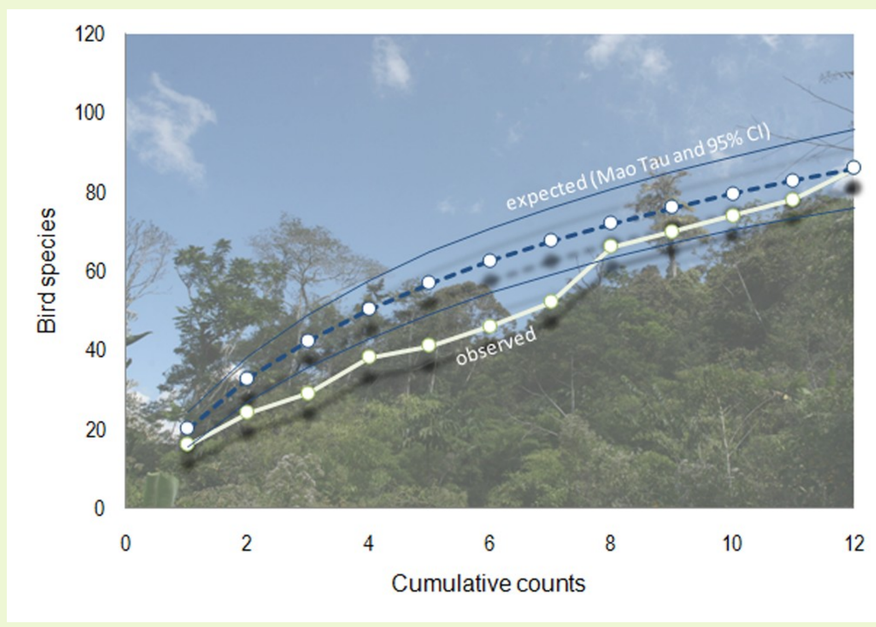

Figure 2 – Bird γ-diversity at the landscape scale: observed bird species accumulation (N_{obs} = 86) and *Mao Tau* expected richness function (with 95% confidence interval). The *Chao2* estimated total species richness was 126 (95% CI: 104-178), explaining the failure of the species accumulation curve to completely level off.

Location

Coffee farms in the subandean humid montane forest in the buffer zone of the Bahuaja-Sonene National Park in SE Peru (14°06' S 69°02' W 900-1500 m ASL)

Method

Bird species were recorded using day-long transect walks in two sites with contrasting human pressure: intensive shade coffee, orchards and secondary forest (6 transects) and secondary forest with shade coffee patches (6 transects).

An indirect gradient approach (non-metric multidimensional scaling and multiresponse permutation procedure tests) was used to detect differences in forest degradation between sites.

Results

At the landscape scale, 86 bird species were recorded, 37 of which were observed only once. The *Chao2* estimated total species richness was 126 (Fig. 2).

In a two-dimensional ordination space (NMS), individual counts of the less disturbed site were separated from the other counts (Fig. 3), but sites did not differ significantly at the community-level (MRPP T = -1.13; A = 0.03; P = 0.13). Observed birds were indicative for one habitat type.

The bird assemblage was dominated by species of forest edges and second growth habitat (78%). The majority of species (68%) had a wide range covering Amazonia and the east slopes of the Andes; only 25 species (29%) were more or less restricted to Andes and the outlying ridges.

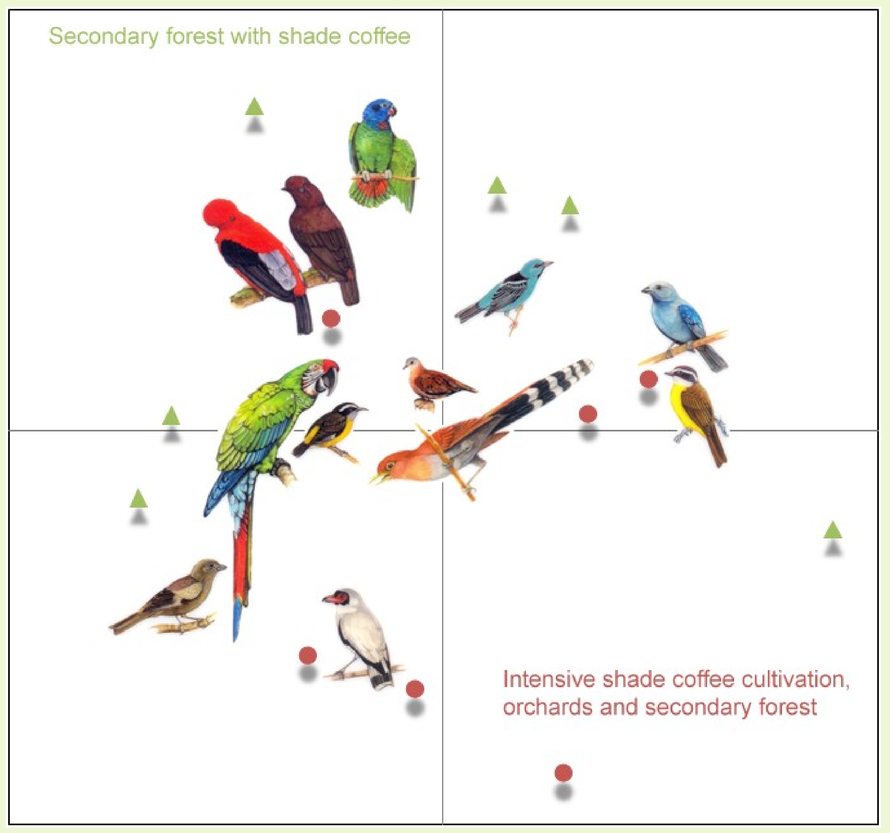

Figure 3 – NMS ordination of bird counts in two sites with contrasting coffee cultivation intensity (NMS1 r^2 = 0.37; NMS2 r^2 = 0.17; final stress in 2-dimensional solution 22.2)
Individual counts are represented by symbols; a selection of bird species is positioned at the end of their respective vector (with origin in the center of the diagram).
Illustrations adapted from Dean & Wainwright (2005) Peru – Aves del Bosque. Rainforest Publications.

Conclusion

The current state of the forest, in both sites with contrasting human influence, can be described as disturbed secondary montane evergreen forest of the transition zone between the Andes and the Amazon.

Despite severe human impact, several forest specialists (22%) of both Andean montane and Amazonian forest persisted – including the enigmatic Andean cock-of-the-rock and Military macaw. For such species, REDD+ projects should not only focus on the sustainable management of the shade coffee stands but also aim to conserve the remaining old-growth secondary forest patches.

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